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ABSTRACT

This study was undertaken to determine the validity of the Differential Aptitude Test (DAT) in general, the differential validity of each score of the DAT, and the effectiveness of high school rank (HSR) as a measure of past performance for predicting success in vocational programs in health careers. Data obtained for a sample of 127 students representing five health occupation programs consisted of: (1) DAT scores, (2) HSR, (3) results of a comprehensive examination at the end of the first quarter of training, (4) final grade point average, (5) scores on a vocational achievement test (NLN), and (6) a certifying examination (DCE) for two programs in the sample. Pearson Product Moment correlations revealed that HSR showed a higher correlation with each of the criterion measures than any of the DAT scores. HSR was a better predictor of success in the Theory subtest of the DCE than of any of the skill-oriented subtests. With respect to the prediction measures and the vocational achievement test, the only independent correlations of some magnitude were between DAT scores and the NLN. (Author/SB)

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A STUDY OF THE PREDICTABILITY OF HIGH SCHOOL GRADES AND THE DIFFERENTIAL APTITUDE TESTS FOR SUCCESS IN VOCATIONAL PROGRAMS IN HEALTH CAREERS

A Thesis

Presented to the Faculty

of the

University of Wisconsin-La Crosse

La Crosse, Wisconsin

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In

Partial Fulfillment

of the

Requirements for the Degree

Master of Science -- School of Psychology

by

Ruth Anderson

December, 1971

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ABSTRACT

This study was undertaken to determine the validity of the Differential Aptitude Test (DAT) in general, the differential validity of each score of the DAT, and the effectiveness of high school rank (HSR) as a measure of past performance for predicting success in vocational programs in health careers. Such information is desirable because of the increasing need for personnel in health careers, the increasing applications to vocational-technical schools, and the limited training facilities for clinical practice. Selection of students must be as objective and efficient as possible.

The population in this study was composed of 127 students representing five separate vocational programs in health careers who were enrolled in one vocational-technical school in the Fall of 1970. Data available were DAT scores and HSR for the total sample, the results of a comprehensive examination at the end of the first quarter of training, and the final grade point average (GPA) of the students. Also available were scores on a vocational achievement test (NLN) and a certifying examination (DCE) for two separate programs in the sample.

Pearson Product Moment correlations were obtained for all the predictor and criterion variables. HSR showed a higher correlation with each of the criterion measures

than any of the DAT scores, yielding coefficients of .28 and .52 with the comprehensive examination and GPA respectively. Of the DAT scores, VR, NA, and the combined scores of VR and NA were the best predictors. When partial correlations were determined between the significant DAT scores and the criterion measures, controlling for HSR, correlations for only one of the test-criterion relationships reached the .05 level.

HSR was a better predictor of success in the Theory subtest of the DCE than of any of the skill-oriented subtests. Only two significant correlations were obtained between the DAT and DCE; two scores of the DAT correlated significantly with a skill-oriented subtest of the DCE.

With respect to the prediction measures and the vocational achievement test, the only independent correlations of some magnitude were between certain DAT scores and the NLN. In each case, with one exception, one DAT score correlated higher with NLN than HSR and NLN.

A study using more extensive data and combining several predictors, which was beyond the scope of this study could possibly yield a higher overall prediction of success. It would also be important to determine whether the same predictors are equally as effective in the separate programs in health careers.

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CHAPTER 1

INTRODUCTION

Man's choice of an occupation prior to the Industrial Revolution was influenced by such forces as heredity, tradition, and superstition. The usual procedure was to follow the trade of the profession of one's father. Little consideration was given to intelligence, aptitude, skills or personal interests. The writings of the early philosophers such as Plato and Pascal indicate that they were concerned about occupational choices and success in that occupation. Cicero in his essay On Duties stated, "We must decide what manner of men we wish to be, what calling in life we would follow, and this is the most difficult problem in the world." (Roberts, 1965, p. 336) The practice of phrenology, the idea that certain mental and moral characteristics could be determined by an inspection of the head, scalp, or face, was used at one time to predict success in occupations and other life activities.

More scientific and sophisticated methods are now being utilized in vocational selection and counseling. Psychologists have recognized that even intelligence tests are quite limited in their coverage and that perhaps not all the important functions are represented. Special aptitude tests now supplement the general intelligence tests, and special batteries of

tests have been constructed for a large number of occupations. Present day programs in vocational guidance have built upon the efforts of Frank Parsons in the early 1900's, and through the assistance of federal funds many institutions have developed effective guidance programs.

The need for more education today is being discussed at an emergency level, and the position is clearly that of a demand for more education. Educational needs vary: for youth, it is choosing and preparing for a career, for some it is to broaden interests, for others, to prepare for a better job involving more skills, and for others, to train for a new job as the demand for their present skills are declining. Technical advances and scientific progress have created numerous job opportunities. The number and types of careers is as diversified as the students themselves. Each person should have the opportunity to experience the psychological meaning of work, to examine the benefits to society of different forms of work, to examine work experiences in terms of what they mean to him personally, and finally, to plan and pursue educational programs that will help him reach his goal.

Many institutions, particularly those of a vocational and technical nature have met this educational crisis with an "open door" policy. Today, applications by both youth and adults to vocational and technical schools are rapidly rising. Many job classifications critically need more and better trained

workers. As applications have increased, many students have been turned away because of lack of space or lack of facilities for field experience.

Providing health care to an increasing population is one of these vital areas. Current and projected shortages of personnel in the allied health careers may even exceed that of the medical profession. Recent estimates by the United States Department of Labor suggest that by 1975 the nation will require 1,200,000 additional personnel in health careers. A study by the American Hospital Association suggests that Wisconsin hospitals will require 14,746 additional skilled personnel by 1975. This estimate does not include the need for skilled personnel in other kinds of health facilities such as clinics, offices, and schools. (Report of Governor's Task Force, 1967, p. 14) Burzynski, (1970) a vocational educator, has called health careers the "promised land" of job opportunities for the paraprofessional worker.

Each individual has certain skills, interests, personality traits, motivation and other characteristics which determine his potential for success in various academic and vocational endeavors. If these characteristics can be measured and their potential value in this respect determined, the selection of students for specific vocational programs could be quite efficient. Vocational and technical schools must, therefore, carefully examine and evaluate selection procedures in order

that they can more effectively assist students in making vocational choices commensurate with their individual abilities and interests and to assist the community to relieve shortages in vital job classifications.

CHAPTER 2

PROBLEM

Prediction, in the broadest sense of the word, is the primary goal of scientific investigations whether in astronomy, chemistry, medicine, or education. The scientist studies the effect of various treatment or selection procedures on substances or organisms so that he can predict the effect of his manipulation on similar organisms. Education and psychology are concerned with the prediction of human behavior particularly in relation to learning capacity, potential growth, success, and adjustments. By increasing man's ability to foretell human behavior under prescribed conditions, science makes it possible for man to make decisions about the future course of action which have a greater probability of fulfilling his goals and purposes.

The objectives of vocational and technical education are to design programs to meet the needs of labor force requirements and to help students make adequate vocational adjustments. Each individual has certain abilities, interests, personality traits, and other characteristics, which, if they were known, would make the selection of students for specific vocational programs

quite efficient. Information reflecting past or present characteristics of individuals which predict future behavior is also used as a means of aiding selection and placement decisions. It is important, therefore, that vocational and technical schools evaluate their selection procedures so they can more effectively assist the students in making vocational choices and serve the community by meeting the needs of the labor force.

The problem of selection and placement decisions for students in various occupational training programs is complex. A variety of techniques or combinations of techniques are used and each of these has certain limitations. Among the procedures employed are the interview, the application blank or personal history, personality, interest, aptitudes and intelligence tests and indices of past performance.

The interview is limited in value because of its subjective nature, particularly if trained interviewers and standardized techniques are not utilized. Application blanks and personal histories are useful in obtaining factual material, but may reveal little of the capabilities and proficiencies of students. High school grades have been found to correlate moderately well with intelligence tests and with subsequent performance in post high school education. Psychological tests have been able to predict

performance in many types of activities. (Super, 1962, p. 11) Objective predictors such as high school grades and psychological tests have also usually been found to be more valid indicators of future academic performance than other techniques.

Despite the extensive validity data that has been obtained for a variety of tests and training situations, the validity of a test is specific to a given criterion or measure of performance as obtained for those in a given population. Consequently, when the criterion changes or the characteristics of the population changes, the index of validity is also likely to be different.

It is important, therefore, for individual institutions to determine the actual predictive validity of various tests and other indices and to develop local norms to establish critical scores which serve as a basis for selection in their own situation. Test publishers and experts constantly exhort consumers to develop their own norms.

It is the purpose of this study to determine the validity of standardized aptitude tests and of a high school performance measure for predicting the academic success of students in health careers in one vocational-technical school, and their performance on specific vocational achievement and certifying examinations.

The specific objectives of the study were:

1. To determine the predictive validity of the Differential Aptitude Tests (DAT) generally for predicting academic

success in vocational programs in health careers.

2. To determine the differential validity of each score obtained from the DAT battery for predicting academic success in health career vocational programs.
3. To determine the effectiveness of high school rank (HSR) as a measure of past academic performance relative to the DAT measures as a predictor of academic success in health careers.
4. To determine the validity of the DAT and of high school performance for predicting performance on end-of-training vocational achievement and certifying examinations for students in two specific programs, practical nursing and dental assisting.
5. To serve as a basis for establishing local norms for those predictor indices that appears to have sufficient validity for selection of students in health careers.
6. To provide a basis for later research on the validity of these and other high school performance and aptitude measures for prediction of subsequent job performance following graduation as well as academic success in vocational training programs.

CHAPTER 3

REVIEW OF LITERATURE

Aptitude Tests as Predictors

For some fifty years psychologists have been developing tests of special aptitudes to supplement tests of global intelligence. These tests were developed primarily for vocational counseling and for the selection and placement of industrial and military personnel. Traditionally, Munsterberg's experiment at the turn of the century on the use of tests with motormen of the Boston Elevated Railway is taken as the first test for personnel selection for a specific job classification. (Ghiselli, 1966, p. 5) World War I with its enormous manpower problems gave impetus to the aptitude testing movement. In the 1920's standardized aptitude tests increased in number, variety and application. The development of specialized tests in clerical, mechanical, and other vocational areas represented some of the earliest interests. Later, test batteries were assembled for the selection of applicants for admission to schools of medicine, law, engineering, dentistry and other professional fields. By the end of World War II the measurement of aptitudes for occupational testing had become quite sophisticated and a generally accepted technique.

A large amount of information has been gathered about the validity of aptitude tests in predicting success in occupational training. Although there is considerable variation in the level of correlation from study to study, it appears that nothing short of standardizing curricula, teachers, and students will eliminate it. (Prediger, Waple, & Nusbaum, 1968) One of the major difficulties in the validation of tests for admitting students to professional or occupational schools is the selection of a criterion of success. If selection tests are validated against grades early in training, they may not be valid for predicting success in the later part of training, since abilities and skills required for success in the early phases of professional and occupational training are often different from those required for success in the final phase. (Travers, 1949, p. 165)

Garrett, (1949) in reviewing studies on aptitude tests as bases for the prediction of academic achievement, concluded that "aptitude tests have demonstrated their validity as predictors and may well receive increased attention as a predictive instrument." He found a summary of 28 coefficients of correlation between scores on general aptitude tests and criterion to show a median coefficient of .43 and the median of 15 coefficients of correlation between special aptitudes and the criterion as .41.

In a project summarizing the many validity studies which have been conducted on aptitude tests for selection of persons to training and placement in various occupations, Ghiselli (1966, p. 115) concluded that tests are more useful in the prediction of training than of job proficiency in most job classifications. The median validity coefficient for aptitudes in training personnel for all jobs listed by the General Occupational Classification System was .30, whereas for the proficiency criteria it was .19. The higher predictiveness of training criteria as compared with proficiency criteria is to be expected since training programs are conducted under more controlled and uniform conditions and measures of success are more reliable.

Tests which measure intellectual, spatial, and mechanical abilities have been found to be more important in determining success in training, while tests measuring perceptual accuracy and motor abilities have been found to be important for both training and proficiency. Ghiselli, (1966, p. 118) Patterson and Ghiselli both found a low level of validity for motor ability tests. (Prediger, et al, 1968)

In general, it can be stated that there are many instances of significant relationships between predictors and criteria, although there is considerable variation in the level of correlation obtained for a given predictor within a given vocational area. Relationships usually improve when

predictors are combined. Although data will provide perspective on what is most likely to be found, in general, one cannot be sure how well a predictor will work in his own situation. (Prediger, et al, 1968)

The Differential Aptitude Tests as Predictors

The Differential Aptitude Tests were developed principally as a battery for vocational and educational guidance of high school students. Their primary function is to predict meaningful criteria. The test manual cites extensive data on the empirical validity of the test battery. The criteria included are grades in high school or college, achievement test results, and success in vocational groups. The data seem to demonstrate that each of the tests is potentially useful, and that some tests are generally more useful than others. The tests have a greater validity for a specific criterion and a specific population. It attempts to measure eight aptitudes; verbal reasoning, numerical ability, abstract reasoning, clerical speed and accuracy, mechanical reasoning, space relations, and language usage in spelling and grammar.

Shults and Keats (Buros, 1965) in reviewing the tests, indicate there are uses for such a battery. They both point out, however, that there is an undue amount of overlap and high correlation between tests, and no use has been made of multiple regression or discriminate analysis in establishing

the validity of the various subtests. Despite the extensive predictive validity coeeficients for the separate scores, the differential validity of the scores in predicting various criteria is still without substantiation. The Differential Aptitude Tests report eight different scores; however, it is possible that only four or five distinct abilities are being tapped. According to factor analysis, the profile could be reorganized in four scores; a verbal composite emphasizing Verbal Reasoning, Spelling, and Grammar; a composite emphasizing Arithmetic Reasoning, Space Relations and Mechanical Aptitude; a numerical factor; and a clerical factor. (Cronbach, 1970, p. 368)

The Differential Aptitude Tests as Predictors of Academic Success in High School

Validity studies have shown that for most high school courses, girls' grades are more predictable than those of boys. (Bennett, et al, 1965, p. 5-2; Jacobs, 1957) The more common courses are predicted best by three or four scores in the battery. Verbal Reasoning and Numerical Ability are in general good predictors. For English and Social Studies as well as for Science and Mathematics, the Numerical Ability score is among the best predictors. (Bennett, 1965, p. 5-3) Ewald (1961) found that the Grammar score of the Differential Aptitude Test was consistently superior to other variables in the differential prediction of all subject matter scholarship. He also found the Numerical Ability was a significant

predictor in several other areas. The score of Abstract Reasoning predicts best the subsequent performance of pupils in science courses and in some schools also predicts moderately well in such areas as commercial courses and industrial arts. (Bennett, et al, 1965, p. 5-3)

Certain scores of the Differential Aptitude Test are not highly effective predictors in the specific areas where their efficiency might be assumed, such as, Clerical Speed and Accuracy as a predictor in business education, and Mechanical Reasoning as a predictor of grades in vocational education. Scores on the Differential Aptitude Tests obtained at the sophomore level of high school were generally significant predictors of the tendency to remain in high school until graduation. (Ewald, 1961) Carmical (1964) found that achievers in a large senior high school scored significantly higher in Verbal Reasoning and Numerical Ability while under-achievers scored higher in Space Relations and Mechanical Ability.

One school system provided evidence concerning the effectiveness of the Differential Aptitude Test for long range prediction of course grades. A group of eighth grade students were tested in 1948. Each term thereafter, until they were graduated, their grades were correlated with their eighth grade Differential Aptitude scores. The evidence indicated that the Differential Aptitude Tests are useful

predictors of grades in courses taken a considerable time after administration of the tests. (Bennett, et al, 1956)

During the 1962-63 school year, a program conducted under the auspices of the Biological Sciences Curriculum Study included approximately 25,000 tenth grade students who studied three different kinds of biology curriculum. About 6,000 were instructed for a six week period in specially prepared "laboratory blocks," so that at least 6,000 students received different instruction than the other students. All students were administered the Differential Aptitude Test Verbal Reasoning and Numerical Ability tests at the beginning of the year and a comprehensive uniform examination at the end of the course. The validity coefficients for "block," "non-block," and a control group were all over .60. In the 1963-64 school year, 1,489 students of above average academic promise from tenth, eleventh and twelfth grade participated in a Second Course Program of the Biological Sciences Curriculum Studies. Relationships were obtained between the Verbal Reasoning and Numerical Ability scores and those on the final examination. The correlations presented separately by grade and sex ranged from 159 to .73. (Bennett, et al, 1965, 5-53 - 5-56) Hollenbach (1967) also found the Differential Aptitude Tests had substantial validities for predicting first year high school biology achievement.

The Differential Aptitude Tests as Predictors of Success in College

Many studies have been made of the predictive success of the Differential Aptitude Tests at the four year college level. Two follow-up studies based on juniors and seniors who were tested in six cities in the East and Midwest in 1947 have been reported. The data derived from the studies reveal a number of relevant observations. Those who attained college degrees were markedly superior on all tests to the average of the high school groups of which they were a part. The superior scores were more pronounced in Verbal Reasoning, Numerical Ability and the Grammatical sections of the Differential Aptitude Tests. Persons who had attended but not completed college were superior in Differential Aptitude scores to the high school populations from which they came, but less so than those who attained degrees. Students in the liberal arts and science groups had higher scores on Verbal Reasoning, Numerical Ability, Spelling, and the Grammar section of Language Usage. (Bennett, et al, 1956)

Ewald (1961) upon investigating the relationship of scores on the Differential Aptitude Test and scholarship in college found that the Verbal Reasoning and Numerical Ability scores are better predictors of college success than the other scores of the battery. A combination of the Numerical Ability and Spelling scores yielded a multiple

correlation of .586, and was a better single predictor than any other single score of the test.

Elton and Morris (1956) found the Differential Aptitude Test to be of "superior value in educational and vocational planning," and that it was as good a predictor of first quarter grades as the American College Examination and English Co-op Mechanics of Expression. Harris and Cole (1960) found the test helpful in predicting acceptance or rejection by the University of Hawaii and approximate college academic performance. In an evaluation of the test they stated, "We can help school counselors to identify the worst and best bets for higher education."

The Differential Aptitude Tests as Predictors in Community Colleges and Technical Schools

Bennett, et al, (1956) found that men who attended special vocational schools rather than college were close to the average of high school students on some scores but inferior on Numerical Ability and Language Usage. Women attending special schools, however, were not markedly different from the average students. Technical school graduates tended to have high scores in Numerical Ability, Space Relations, and Mechanical Reasoning.

In the Connecticut Technical Schools, studies to predict success in five shop areas using the Differential Aptitude Tests suggest that different abilities are required for success in the five shops. The Verbal Reasoning and

Numerical Ability scores tended to have relatively high relation to success in all general education and shop courses. The Abstract Reasoning, Space Relations, and Mechanical Aptitude scores were found to be more useful in predicting shop success. (Stoughton, 1955) In seven Ohio schools, Doppet, Seashore, and Odgers (1959) found the sum of Mechanical Reasoning, Space Relations, and Abstract Reasoning to be a good predictor of success in Machine Shop, but found that the test was not satisfactory in predicting success in Auto mechanics. Foote (1960) found among predictors from several aptitude scores that the Differential Aptitude Mechanical Reasoning was significant in the prediction of graduation from the automotive curriculum. In one Institute of Technology, correlations with academic success for students other than those majoring in chemistry or chemical engineering were high for Verbal Reasoning (.41) and Mechanical Aptitude (.49). (Swanson & Berdie, 1961)

Hasley (1956) investigated the predictive value of certain measures used in selecting students in a community college. In using seven scores from the Differential Aptitude battery, he found Numerical Ability, Space Relations, and Mechanical Reasoning to correlate most closely with construction, electrical and industrial chemistry and mechanical technologies.

Myers (1968) compared the Differential Aptitude patterns of Junior College Students in five semi-professional fields. It was found that successful junior college students in one specialization differed significantly from students in another specialization. Successful students differed from unsuccessful students in the same specialization. The fields of specialization studied were Dental Hygiene, Retail Distribution, Electrical Technology, Mechanical Technology, and Executive Assisting.

The Differential Aptitude Tests as Predictors in Occupational Careers

Hull (1955) in a study to determine whether occupations tend to be characterized by profile patterns on the Differential Test battery found that the scores discriminated into three groups; clerks, salesmen, and skilled groups; mechanical, electrical, building, and unskilled groups; and college students, particularly in the liberal arts.

Engineers have been found to be decidedly superior on all tests, while businessmen were slightly above average on most tests but below average in Space Relations and Mechanical Reasoning. Among the women tested, teachers scored higher than nurses, nurses scored higher than stenographers, and stenographers scored higher than clerks. (Bennett, et al, 1956) The highest scores for nurses were obtained in Verbal Reasoning and Space Relations, the lowest scores, in Clerical Aptitude and Mechanical Reasoning. (Bennett, et al, 1965, p. 5-44)

Three scores from the Differential Aptitude Tests, Numerical Ability, Verbal Reasoning, and Space Relations have been used with the Bennett Test of Mechanical Comprehension in the successful selection of shop apprentices. (Lawshe and Balma, 1966, p. 247) The test battery was also helpful in selecting drafting trainees. (Lawshe and Balma, 1966, p. 247)

In predicting the success of engineering students, Wood and Lebold (1963) found that the Space Relations subtest together with Grade Point Average and the Mathematics subtest of the Standard Achievement Test were optimal predictors. Berdie, (1951) however, found that the scores of the Differential Aptitude Tests, with the exception of Numerical Ability, did not contribute significantly to the predictions of academic success of engineering students in an Institute of Technology. He concluded, "The tests which appear to differentiate adequately between twelfth graders for whom they were apparently designed are not of sufficient difficulty to use with engineering students."

Predictors in Vocational Programs in Health Careers

Vocational programs in health careers with the exception of practical nursing are relatively new. Some programs that have formerly been operated by hospitals and clinics have been transferred to post secondary academic institutions, particularly community colleges and technical schools.

Validity studies on the prediction of academic success in such programs is missing in the present literature.

A study reported from a School of Practical Nursing in Massachusetts to determine the applicant's potential to succeed used the National League for Nursing Preadmission and Classification Examination (PACE) and the Psychological Corporation Preadmission Examination. The PACE measures areas of general information, judgment, science and health information, arithmetic, vocabularly and reading. The Psychological Corporation Entrance Examination measures verbal, numerical, science, reading and academic ability. Personality characteristics were measured by the Personal Preference Schedule. A correlation of 0.68 was obtained for the PACE and 0.41 for the Psychological Corporation Examination. (Nursing Outlook, September, 1971, p. 611)

Bailey (1968) studied the relationship of ability and previous academic achievement to success in the practical nursing program from a population of students enrolled in a U. S. Office of Education research project. In comparing previous achievement and ability with practical nursing school achievement, students' class rank in high school was found to be related significantly to practical nursing classroom achievement, to clinical achievement, and to state board scores. The Grade Point Average, however, was related significantly only to practical nursing classroom achievement and state board examination scores.

The Differential Aptitude Tests and Achievement Tests

In general, the validity of the Differential Aptitude Tests for predicting academic success as measured by the standardized achievement tests is better than that of course grades. High correlations with the Iowa Tests of Educational Development, Iowa Tests of Basic Skills, Metropolitan Achievement Test and the Standard Achievement Test are reported in the manual. (Bennett, et al, 1965, p. 5-33 - 5-38) Doppelt and Wesman (1952) also found high correlation between Iowa Tests of Educational Achievement, the Essential High School Content Battery and the Differential Aptitude Tests.

Past Academic Performance as a Predictor of Future Academic Success

Grade point averages have also been used to predict academic success. Travers (1949) and Garrett (1949) in reviewing studies of student achievement concluded that the best single predictor of general academic success in college is the student's high school record. Garrett cited the mean coefficient of correlation with average college grades as .55. Black (1965) upon investigating the predictive value of selected factors for achievement of Lee College freshmen found that the best individual predictor was the high school grade point average.

Lunneborg and Lunneborg (1969) investigated the problem of predicting success in community college vocational courses. Using a traditional battery designed

to predict strictly academic areas, the investigators found the cumulative grade point averages for 2800 students in areas of agriculture, auto mechanics, data processing, engineering technology, electronics, secretarial studies, and welding at six community colleges to be as predictable as for university courses. It is interesting to note that high school grades in English and electives were the most consistent predictors.

Malone (1966) in a study of students enrolled in post high school public vocational education programs in Iowa during the 1964-65 school year, found that academic factors, principally high school grade point average, rank in high school class, and grade point averages in selected high school subject areas were the most consistent predictors of success. Bauer, Mehrens, and Vineonholer (1968) found grade point average a better predictor in selecting programmer personnel than the Strong Vocational Inventory Blank, the Aptitude Test for Programmer Personnel, and the College Qualifying Test.

Summary

Tests of special aptitudes have been developed to supplement tests of global intelligence, to aid in vocational counseling, and in the selection and placement of personnel. Although a large amount of information has been gathered about the validity of aptitude tests, the

results vary from study to study. Aptitude tests have in general been more successful in predicting success in training than in success on the job.

The Differential Aptitude Tests have been developed primarily for the vocational and educational guidance of high school students. The data seem to demonstrate that each of the tests is potentially useful for predicting success in academic and vocational training, and that some of the tests in this battery are generally more useful for these purposes than others. The validity has been found to vary for a specific population and criteria.

The scores of Verbal Reasoning and Numerical Ability have been found in general to be good predictors of scholastic success in the post high school training, however, have not always been found to be most predictive of performance of certain skills where logically they would be expected.

The Differential Aptitude Tests have shown that scores of students in one specialization have differed significantly from those of students in another specialization and scores of successful students have differed from those of unsuccessful students. No validity studies of the DAT with respect to success in vocational programs in health careers other than those in practical nursing were found in the literature.

Past academic performance has also been used to predict future academic success. Studies in the literature have consistently reported high school performance as the best single predictor of success in college and vocational and technical education. The correlations have frequently been even higher when high school performance is combined with other predictors.

It is important, therefore, for institutions to determine the actual predictive validity of various tests and other indices to serve as a basis for selection in their own situation and to develop norms to aid in the use of tests selected on this basis.

CHAPTER 4

METHOD

Site of the Study

Western Wisconsin Technical Institute is a public educational institution which provides a comprehensive career campus offering occupational training and technical education beyond high school. It is administered by Western Wisconsin District No. 2 Board of Vocational, Technical and Adult Education at La Crosse, Wisconsin, and encompasses seven counties. The full-time student enrollment in daytime programs numbers approximately 1800. (Western Wisconsin Technical Institute 1971-73 Catalog)

The Health Occupations Division has at present six vocational programs in health careers. The growing importance of the school in the community, a rapidly increasing application rate, limited facilities for directed clinical practice for large numbers of students, and a definite need for skilled health workers particularly in outlying areas served by the school has emphasized the need to learn as much about the students enrolled in programs as possible. Selection to the programs must be as objective and as effective as present knowledge can make it.

An "open door" policy is maintained by the institution but applications to some programs exceed the number that can be accepted. At present, selection procedures for vocational programs in the Health Occupations Division are based on scores on the Differential Aptitude Tests, high school performance, and a preadmission interview.

Subjects

The sample used in this study were the students entering vocational programs in Health Occupations at Western Wisconsin Technical Institute in September, 1970. The enrollment consisted of 138 students representing five programs. There were 35 students in the dental assisting program, 34 in the medical assisting program, 17 in the operating room assistant program, 40 in the practical nursing program, and 14 in the ward clerk program. The ward clerk program is two quarters in length, the dental, medical, and operating room assisting programs are three quarters in length and the practical nursing program is four quarters in length.

The students ranged in age from 17 to 47 with approximately 10 percent of the students over 25 years of age. There were 136 female students and 2 male students. All students were high school graduates or had high school equivalency certificates. During the first quarter, all students were enrolled in a "core"

curriculum which consisted of areas of content, concepts and learning experiences identified as essential to all students in health occupations. The curriculum for the remaining quarters of each program was specific to the occupations for which they were being prepared. Eleven of the original 138 students were deleted from the study because of incomplete data resulting in a total sample of 127 for which the analogies in this paper will be carried out.

Measuring Instruments

The predictor measures available for study were the class rank of the students upon graduation from high school and scores on eight tests of the Differential Aptitude Test battery. Available criterion measures of performance were the scores on the "core" examination taken by all students at the end of the first quarter and the students' final grade point average. Also available for those in the specific programs were the scores on two standardized tests, the Dental Certifying Examination and the National League for Nursing Examination.

Predictors

1. The Differential Aptitude Tests: The Differential Aptitude Tests (DAT) were developed by the Psychological

Corporation principally as a battery for the educational and vocational guidance of high school students, but are also applicable to adult groups for purposes of counseling and selection. The DAT is comprised of the following eight tests:

Verbal Reasoning (VR): This test is designed to measure the subject's ability to handle verbal concepts and aimed at ability to think constructively rather than simple fluency or verbal recognition.

Numerical Ability (NA): These items are designed to test understanding of numerical relationships and facility in handling numerical concepts.

Abstract Reasoning (AR): This test is intended as a nonverbal measure of the student's reasoning ability. It supplements the general intelligence aspects of the Verbal and Numerical tests.

Clerical Speed and Accuracy (CSA): A test measuring speed of response in a simple perceptual task involving simple number and letter combinations.

Mechanical Reasoning (MR): Measures the ability to learn the principles of operation and repair of complex devices. This test is of less educational and vocational value for girls. The mean scores of girls are lower and the reliability of measurement is poorer.

Space Relations (SR): A test requiring the ability to visualize a three dimensional object from a two dimensional pattern as well as the ability to imagine how the object would look if it were rotated in various ways.

Language Usage, Spelling (Sp): Measures the student's ability to identify correct spelling of words shown by previous investigation to occur most frequently in writing.

Language Usage, Grammar (Gr): Measures the student's ability to distinguish between good and bad grammar, punctuation and word usage. (Bennett, et al, 1965)

The test does not attempt to isolate simple, pure abilities, but rather measures complex abilities that have a fairly direct relation to job families and curricula. Achievement subtests are included because of their predictive value. A composite verbal-plus number score is used for the same purposes as a Verbal IQ. (Cronbach, 1970, p. 353)

The standardization sample came from 95 communities in 43 states representing all major geographic areas. More than 50,000 students from 195 schools from grades eight through twelve are included in the norms. In addition to raw scores, percentiles and stanines may be obtained on each subtest. (Bennett, Seashore & Wesman, 1966, p. 3-2) The test is available in two alternate forms L and M.

Reliability coefficients for Forms L and M were computed for each test, separately for each sex in each

grade, for a sample of students drawn from the standardization population. The mean reliability coefficients, mean scores and standard deviation of Form L of the DAT by sex is shown in Table 1.

Form L of the entire DAT battery was administered to each applicant to vocational programs in health careers. The test was given at Western Wisconsin Technical Institute on several dates during the semester preceding the students' admission and applicants were notified as to which dates they would have an opportunity to take the test. A total of nearly four hours is needed to complete the battery.

2. High School Rank (HSR): The high school rank and size of graduating class was obtained from the file on each student and from this information a percentile rank computed for each student to adjust for differences in high school class size. The percentile rank was converted to a standard score equivalent assuming an underlying normal distribution and the converted scores were used in the data analysis for this study.

Criterion Measures

One criterion of success in vocational programs was designated as graduation from the program which was contingent upon a grade point average of 2.00. Unsuccessful students were those who withdrew because of poor scholarship or who had a grade point average of less than 2.00 at the time of withdrawl.

TABLE 1

MEAN RELIABILITY COEFFICIENTS, MEAN SCORES, AND STANDARD DEVIATIONS OF FORM L OF THE DAT AS SHOWN BY SEX

	BOYS (N 913)			GIRLS (N 930)		
TEST	Average r	Average Mean	Average SD	Average r	Average Mean	Average SD
Verbal Reasoning	.92	25.3	9.8	.93	24.9	10.3
Numerical Ability	.90	22.5	7.8	.90	21.3	7.8
VR NA	.94	47.8	16.3	.95	46.1	16.8
Abstract Reasoning	.91	32.0	9.6	.93	30.8	10.5
Clerical S and A		49.4	11.8		56.6	13.4
Mechanical Reasoning	.87	47.4	8.8	.79	38.2	7.9
Space Relations	.94	31.1	12.1	.93	27.0	11.1
LU-I: Spelling	.93	63.0	15.3	.93	71.8	14.7
LU-II: Grammar	.89	27.8	9.4	.90	31.7	10.0

(Bennett, et al, 1966, p. 6-4)

1. Core Examination: The Core Examination was a comprehensive test used as a tool in curriculum evaluation as well as an index of student achievement. It was constructed from a pool of multiple choice items submitted by instructors of the four courses that comprised the core curriculum and designed to measure the achievement of each of the objectives on the course outlines. The Kuder-Richardson measure of reliability was .70.

2. Grade Point Average (GPA): The following system is used by the institution to determine a student's grade point average: Each A equals four grade points per credit, each B equals three grade points per credit, each C equals two grade points per credit, each D equals one grade point per credit, and F earns no grade points. A student's grade point average is determined by adding all grade points and dividing by the sum of all credits passed and failed. This data was available for all subjects in the sample.

3. The Dental Certifying Examination (DCE): The Dental Certifying Examination is a standardized test and was administered at the completion of the program to all those enrolled in the dental assisting program. It yields a raw score and percentile rank in dental theory and three areas of clinical practice; Radiography, Stone Casting and Acrylic Tray. A raw score of 75 or above on all four of the subtests permits the subject to practice as a certified dental assistant in

the State of Wisconsin. Data on the standardization of the test is not available at this time.

4. National League for Nursing Achievement Test (NLN): The National League for Nursing Achievement Test was administered to the students in the practical nursing program at the completion of the third quarter of the program. It yields a raw score and percentile score in seven areas of nursing; Body Structure, Basic Nursing, Nutrition, Medical-Surgical Nursing, Maternal-Child Nursing, Pharmacology, and Psychiatric Nursing. The norms of the first six tests are based on 1000 students in 39 schools of Practical Nursing in the United States. The norms on the Psychiatric Nursing subtest are based on scores of 4,200 psychiatric aides in 72 hospitals in 35 states. The NLN Achievement Tests are not intended to determine pass-fail status or final grades, but rather are to help users to evaluate the effectiveness with which they are meeting the objectives of similar educational programs as defined by representatives of these programs throughout the country.

Data Analysis

In addition to obtaining means and standard deviations for all predictor and criterion measures, Pearson Product Moment correlations were computed between all of these measures. Where measures were obtained only for subgroups among the total sample, these statistics were computed only for those in the subgroups.

CHAPTER 5

RESULTS

Table 2 shows the means and standard deviations for the predictor variables, each score on the DAT battery, and high school rank and for the criterion measures for the total sample. The mean raw scores of the students in the sample were quite comparable to those of a representative norm group of 2000 senior high school girls tested in the Fall Semester of twelfth grade as shown in Table 3. (Bennett, et al, 1965, p. 3-12) The means and standard deviations of the students in the sample were equal to or slightly higher on all but two DAT scores. The only large difference was in Clerical Skill Ability where the mean raw score of the students in the present study was nine points below that of the norm group. The test standard deviations for the students in the present study were slightly lower than those of the norm group. A higher degree of homogeneity is to be expected for an entering sample of vocational students since one would expect that selective factors might be operating at both the higher and lower levels with respect to test performance.

The intercorrelations between the DAT scores are shown in Table 2. If two tests correlate highly with each other, a person's relative standing on one will

TABLE 2

MEANS AND STANDARD DEVIATIONS FOR THE PREDICTOR VARIABLES, EACH SCORE ON THE DAT, HIGH SCHOOL RANK, AND CRITERION MEASURES FOR THE TOTAL SAMPLE (N=127)

DAT	NA	VR NA	AR	CSA	MA	SR	Sp	Gr	H.S. Rank	Core Exam	GPA	Mean	S.D.
VR	.33**	.74**	.35**	.09	.29**	.11	.15*	.48**	.42**	.18*	.27**	33.7	7.1
NA		.81**	.42**	.24**	.23**	.21**	.25**	.29**	.55**	.11	.33**	23.4	6.8
VR+NA			.52**	.21**	.41**	.20*	.25**	.51**	.61**	.18*	.37**	57.5	11.2
AR				.18*	.40**	.31**	.13	.17*	.32**	.06	.19*	36.1	7.6
CSA					.11	.04	.13	.03	.26**	.16*	.23**	50.8	9.4
MA						.25**	.12	.12	.28**	.21**	.21**	40.3	7.2
SR							.13	.06	.10	.05	.11	32.7	12.7
Sp								.05	.21**	.10	.07	82.0	11.8
Gr									.50**	.16*	.21**	35.7	8.1
H.S.Rank										.28**	.52**	51.6	7.4
Core Exam											.59**	74.8	17.7
GPA												2.4	.7

*$p < .05$; $r > .15$
**$p < .01$; $r \geq .21$

TABLE 3

MEAN RAW SCORES AND STANDARD DEVIATIONS
OF NORM GROUP AND OF STUDENTS IN THE SAMPLE

	Norm Group		Students in Sample	
	Mean	S.D.	Mean	S.D.
VR	30.0	11.4	33.7	7.12
NA	23.3	8.8	23.4	6.88
VR+NA	53.2	18.9	57.5	11.3
AR	33.3	10.2	36.1	7.6
CSA	59.7	12.9	50.8	9.4
MR	40.5	7.9	40.3	7.2
SR	30.9	12.0	32.7	12.7
Sp	80.1	13.4	82.0	11.8
Gr	37.7	10.5	35.7	8.13

tend to that degree to correspond to his relative standing on the other. Therefore, the likelihood of discovering different abilities that are important in prediction is quite small for any pair of tests with a high correlation. It is noted that the correlations are higher for those DAT tests which measure abilities which on logical grounds appear to be similar. The intercorrelations among the DAT scores in the present sample is somewhat lower than those obtained and reported for other samples. (Bennett, et al, 1965, p. 7-4)

With respect to the predictors as a whole, it also can be noted in Table 2 that HSR tends to correlate quite highly with several of the DAT scores, especially the combined VR+NA scores, and generally tends to correlate more highly with the set of DAT scores than does any single DAT score other than the VR+NA score. It appears that HSR reflects a number of the factors measured by the separate DAT tests.

Data concerning the criterion measures is also shown in Table 2. Only a moderately high correlation was obtained between the Core Examination and GPA. This indicates that these measures were assessing somewhat different aspects of academic performance.

With respect to the relations between the DAT scores and the criterion measures; for the Core

Examination only one of these (MR) was the correlation significant at the .01 level, while the correlations for VR, VR+NA, CSA, and Gr were significant at the .05 level. For overall GPA, significant correlations were obtained with AR at the .05 level and with the VR, NA, VR+NA, CSA, MR, and Gr scores at the .01 level. HSR, however, showed a higher correlation with each of the criterion measures than any of the DAT scores yielding coefficients of .28 and .52 respectively with the Core Examination and GPA.

One of the questions of interest in this study was the relative extent to which each of the alternate predictors was able to predict the criterion measures independent of the other measures. It is possible that two predictors may both show high correlations with a criterion as a result of the fact that they are both measuring the same qualities to a great extent. In this case, it is not necessary to consider and use the one showing the lower correlation if it does not, in fact, contribute to the prediction over and above that provided by the other predictor.

Considering that HSR shows the highest correlation with the criterion measures and at the same time correlates quite highly with the DAT scores that also have significant correlations with the criterion, the question is whether the latter correlations are not simply

reflecting the former relationships i.e. whether or not the DAT scores are measuring anything over and above, that is, independent of the qualities assessed by HSR.

To determine the extent to which each of the significant DAT score-criterion correlations was independent of the HSR-criterion relationship, partial correlations were determined between these test scores and each criterion controlling for the contribution of HSR to the relationship. Table 4 shows the first order partial correlations between DAT scores having significant zero order correlations with the criterion measures and each criterion measure controlling for differences in HSR.

TABLE 4

PARTIAL CORRELATIONS BETWEEN DAT SCORES AND CRITERION MEASURES CONTROLLING FOR HSR.[1]

Criterion Measures	DAT SCORES						
	VR	VR NA	NA	AR	CS	MA	Gr
Core Exam	.07	.01	.-05	.-05	.08	.15*	.09
GPA	.07	.08	.07	.02	.11	.03	.-06

*$p < .05$; $r > .15$

1. $r_{12.3} = \frac{r12 - r13\ r23}{\sqrt{1-r^2_{13}}\ \sqrt{1-r^2_{23}}}$

When partial correlations between significant DAT scores and each of the criterion measures controlling for HSR were determined, correlations for only one of the test criterion relationships (MA) with Core Examination reached the .05 level.

Table 5 presents the means and standard deviations for the DAT scores, HSR, the Core Examination, GPA, and the Dental Certifying Examination (DCE), and the interrelations between the predictors and criterion measures of 19 students enrolled in the Dental Assisting Program. The only significant correlation ($p < .05$) among the indices of general academic performance and the DCE was between the final GPA and the Theory score. Among the predictors, the only significant correlations ($p < .05$) were those between AR and MA scores and the Radiography subtest and that between HSR and the Theory score ($p < .01$).

Table 6 presents the means and standard deviations for the DAT scores, HSR, the Core Examination, GPA, and the NLN, and the intercorrelations between the predictors and criterion measures for the 36 students enrolled in the Practical Nursing Program. The significant correlations among the indices of academic performance and the NLN were those between the Core Examination and Body Structure, ($p < .05$) Maternal-Child Nursing and Psychiatric Nursing, ($p < .01$) while GPA correlated

TABLE 5

MEANS, STANDARD DEVIATIONS, AND INTERCORRELATIONS OF DENTAL CERTIFYING EXAMINATION, DIFFERENTIAL APTITUDE TEST, HIGH SCHOOL RANK, CORE EXAMINATION AND GRADE POINT AVERAGE FOR STUDENTS IN THE DENTAL ASSISTING PROGRAM (N=19)

DAT	Theory	Radiography	Stone	Acrylic	Mean	S.D.
VR	.17	.02	.21	.29	37	3.5
NA	.15	.12	.24	.04	26	5.7
VR+NA	.21	.06	.30	.17	63	8.3
AR	.11	.52**	.12	.04	38	6.0
CSA	.17	.02	.31	.18	52	8.1
MA	.07	.55**	.08	.21	41	6.2
SR	.24	.31	.06	.12	33	11.92
Sp	.12	.18	.12	.21	84	15.2
Gr	.13	.02	.23	.02	39	12.3
H.S. Rank	.48*	.03	.19	.12	56	4.9
Core Exam	.36	.24	.16	.16	79	5.2
GPA	.58**	.20	.11	.07	2.6	.5

*$p < .05$; $r \geq .37$

**$p < .01$; $r \geq .50$

TABLE 6

MEANS AND STANDARD DEVIATIONS AND INTERCORRELATIONS OF NATIONAL LEAGUE FOR NURSING ACHIEVEMENT TEST, DIFFERENTIAL APTITUDE TEST, HIGH SCHOOL RANK, CORE EXAMINATION, AND GRADE POINT AVERAGE FOR STUDENTS IN THE PRACTICAL NURSING PROGRAM (N=36)

DAT	Body Structure	Basic Nursing	Nutrition	Med-Surg	Mat-Child	Pharm	Psych	Mean	S.D.
VR	.09	.06	.16	.23	.17	.13	.24	34	5.2
NA	.03	.11	.03	.19	.14	.09	.00	22	6.2
VR+NA	.03	.12	.11	.27*	.22	.14	.12	57	7.5
AR	.24	.36*	.17	.14	.45*	.19	.07	36	10.0
CSA	.11	.33*	.15	.17	.08	.06	.09	50	9.1
MA	.13	.00	.18	.21	.03	.20	.29*	41	8.7
SR	.04	.23	.15	.13	.18	.07	.05	32	6.8
Sp	.22	.48**	.08	.01	.10	.20	.14	78	11.8
Gr	.15	.23	.33*	.48**	.22	.47**	.54**	35	11.8
H.S. Rank	.22	.05	.34*	.43**	.09	.33*	.28*	52	5.8
Core Exam	.34*	.21	.25	.12	.48**	.05	.41**	80	4.7
GPA	.64**	.43**	.64**	.58**	.45**	.39**	.34*	2.8	.4

*$p < .05$; $r \geq .27$

**$p < .01$; $r \geq .38$

significantly with Psychiatric Nursing at the .05 level and with Body Structure, Basic Nursing, Nutrition, Medical-Surgical Nursing, Maternal-Child Nursing, and Pharmacology at the .01 level.

For the DAT predictors, significant correlations were obtained between VR and Maternal-Child Nursing; Sp and Basic Nursing; Gr and Medical-Surgical Nursing; Pharmacology and Psychiatric Nursing, all at the .01 level, and between VR+NA and Medical-Surgical Nursing; AR and Basic Nursing; CSA and Basic Nursing; and MA and Psychiatric Nursing, all at the .05 level. HSR correlated significantly with Medical-Surgical Nursing at the .01 level and with Nutrition, Pharmacology and Psychiatric Nursing at the .05 level. In each instance, the HSR correlations were of a lower magnitude than those obtained for one of the DAT scores with the exception of HSR with one exception.

Discussion of Results

In determining the differential validity of each score in the DAT battery for predicting academic success, the highest correlations for the total sample were obtained between the predictors and the scores or VR, NA, and VR and NA combined. It appears that the behaviors which were required for high scores on the Verbal Reasoning and Numerical Ability scores of the DAT are

required for a high grade point during and at the end of the training period in vocational programs in health careers. The third highest correlations were between the CSA of the DAT and GPA. The curriculums of three programs in this sample includes courses requiring clerical skill ability such as typing and office procedures.

In regard to the predictive validity of the Differential Aptitude Tests generally for predicting academic success in vocational programs in health careers, it seems possible thet the DAT scores may do a better job than HSR of predicting skill performance differences but these are not apparently represented as heavily in the criterion measures (GPA) as academic performance. This possibility is suggested, but not strongly supported, in the two higher correlations for DAT scores on the Radiography test than on the Theory test of the DCE, and also that these correlations were much higher than those for HSR.

Among the predictors considered for the sample as a whole, HSR shows the highest correlation with the criterion measures of academic success. These correlations were higher than any of those obtained for the DAT scores for both criterion measures. The same qualities that contributed to good grades in high school also seem to have contributed to good grades in vocational programs

in health careers. It is possible that HSR may also be a better predictor than the DAT because it reflects academic motivational factors as well as ability. Such qualities are not likely to be reflected to any extent in aptitude tests.

Of the predictors, high school rank correlated more closely with the Theory subtest of the vocational certifying examination than with any of the skill oriented tests of the examination. Significant correlations were obtained between AR and MA of the DAT and the Radiography test. It would be expected that these two abilities would be important aptitudes in Dental Radiography.

In respect to the vocational achievement test for practical nursing, the only independent correlations of some magnitude were between certain DAT scores and the NLN. Results seem to indicate that the highest achievers on the NLN also had the highest abilities in Verbal Reasoning, Numerical Ability, Abstract Reasoning, Grammar, and Spelling. For this index of achievement, in each instance HSR correlations were of a lower magnitude than those obtained for one of the DAT scores with one exception, that between HSR and Nutrition.

Quite high correlations between academic achievement measures, especially GPA, provides an indication of the validity of the GPA and Core Examination as an index of achievement relevant to practical nursing.

In summary, there was some indication in this study that DAT scores may do a better job of predicting skill performance differences than academic success, but these were not represented as heavily in the criterion measures. It appears, however, that the same qualities that contributed to good grades in post high school also contributed to good grades in post high school vocational programs. It is quite possible that HSR reflects such qualities as academic motivational factors as well as ability. Such qualities are not as likely to be reflected in aptitude tests.

This study has several limitations. Since the total sample was to some extent a selected group, the range of variation on certain predictors would be more restricted than for a typical applicant sample. The restrictions would be greater for those characteristics used to make this selection. Consequently, the obtained correlations for the restricted variables are likely to be lower than would be obtained for an unselected applicant sample. A follow-up study investigating the same relations for an unselected sample would give a more accurate indication of the validity of the predictors when used for selection from a true applicant population.

The results are based on a relatively small sample, and the students represented only one class of students in one division who were enrolled in the school in the

Fall of 1970. It is possible that the same results would not have been obtained with students in other programs.

No attempt was made to correlate the predictors with the criterion measures for each of the five separate health career programs, in part because of the small number in each group. It is possible that the same abilities are not required for success in each program in the division.

Also, since this study was conducted at the end of the training period, it was not possible to assess job proficiency. Job proficiency does not necessarily follow success in training.

CHAPTER 6

SUMMARY AND CONCLUSIONS

Results of this study indicated that high school performance was a better predictor of academic success in vocational programs in health careers than any score obtained from the DAT for the sample that was used. The results are consistent with Malone's (1966) findings that high school performance was the most valid predictor of success in post high school vocational education programs in Iowa, and with Lunneborg and Lunneborg (1969) who found high school grade point average in a sample of 2800 students to be as good a predictor of vocational courses as in traditional university courses. Travers (1949) and Garett (1949) in reviewing studies of student achievement at an earlier date also concluded that the best single predictor of general academic success in college is the student's high school grade point average.

The DAT scores were better predictors of final success in the program than they were of success at the end of the first quarter. The final grade point represents performance during one-half to three-fourths more training in concepts and skills specifically related to the health program in which the student was enrolled. The observation of others that abilities and skills required for success in the final phase is also likely

to be applicable here. (Travers, 1945, p. 165) Although several DAT scores showed significant correlations with the overall achievement criteria, these correlations were lower than those for HSR. When partial correlations between significant DAT scores and each of the criterion measures controlling for HSR were determined, the nonsignificant first order correlations indicate that the DAT scores were not measuring to any significant extent relevant qualities other than those measured by HSR.

There was some evidence that the Differential Aptitude Tests did a better job than high school rank of predicting skill performance. Two scores of the DAT correlated significantly with the scores on the skill-oriented tests. Of the DAT scores, VR and NA were the two best predictors. Bennett, et al (1965) reported Verbal Reasoning and Numerical Ability as being good predictors of academic performance generally. Although it was a better predictor than other scores in this study, the correlation for the combined VR and NA score yielded a value (.37) that is considerably less than correlations with scholastic success having values of .70 or higher that have frequently been reported. (Anastasi, 1968, p. 340) It should be emphasized, however, that a low correlation between

a DAT score and the criterion does not necessarily mean that a minimal amount of the aptitude being measured is required for a specific criterion. For example, a correlation of .07 between the Sp score of the DAT and GPA in health careers does not reflect the possibility that almost all students in health careers have exceeded a minimal level of competency in the performance area with the consequence that spelling may fail to be a good predictor. A low correlation may also reflect a high degree of selectivity with respect to a given characteristic.

High school performance was a better predictor of success in the Theory subtest of the Dental Certifying Examination than of any of the skill-oriented subtests. Performance during training and final grade point also correlated more closely with the theory subtest than with the skill-oriented subtests. Only two significant correlations were obtained between the DAT tests and the DCE; MR and AR of the DAT correlated with the Radiography subtest of the DCE.

Significant correlations were obtained between high school rank and four subtests of the NLN Achievement Test, and the Core Examination and three subtests of the NLN Achievement Test. The correlations increased considerably between the NLN and GPA. The DAT scores correlating significantly with the NLN were those

measuring verbal and language abilities. In respect to HSR and NLN, in each instance the correlations were of a lower magnitude than those for one of the DAT scores with the exception of HSR and Nutrition.

It appears from this study that grades in vocational programs in health careers are definitely related to measures of the student's ability to read, express himself verbally, or write coherently, suggesting that these qualities are contributing to their academic performance. This may be in conflict with the objectives of some vocational programs.

It is important that empirical studies testing the validity of testing instruments such as the DAT be conducted by those who rely upon the results of these tests. Rather than adopt a test and use it in the process of student selection on the basis of its content validity, studies should be made of its validity for the situation and purposes for which it is being used.

A study using more extensive data and combining several predictors, which was beyond the scope of this study, could possibly yield a higher overall prediction of success. It would also be important to determine whether the same predictors are equally as effective in each of the separate vocational programs in the Health Occupations Division.

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